



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,471	05/21/2007	Katsumi Furuya	HZA-0003	1459
23353 7590 01/11/2008 RADER FISHMAN & GRAUER PLLC LION BUILDING 1233 20TH STREET N.W., SUITE 501 WASHINGTON, DC 20036			EXAMINER LEUNG, QUYEN PHAN	
			ART UNIT 2874	PAPER NUMBER
			MAIL DATE 01/11/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/591,471

Applicant(s)

FURUYA ET AL.

Examiner

Quyen P. Leung

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 10 and 28 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1, 10, 28 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 20070521.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application
- ☐ Other: ____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 5/21/2007 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. Applicant failed to provide JP 2001-518707A (reference BM) or Yamada (Theoretical Analysis... Switches) (reference CJ).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 10, 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Martinez et al (Ultrashort 2-D Photonic Crystal Directional Couplers, May 2003 article). Martinez et al discloses the claimed invention.

Re claims 10 and 28, see the abstract and figure 1 for a photonic crystal coupling defect waveguide comprising: a photonic crystal including photonic crystal elements (rods) constituting a periodic structure (having lattice constant a) and, for suppressing

propagation of an electromagnetic field including light or a radio wave of a specific wavelength or in a specific frequency range; and a coupling waveguide including at least two waveguides (see abstract for two parallel waveguides), each of which includes a line defect that is a plurality of defects which are portions where the photonic crystal elements constituting the periodic structure of the photonic crystal are locally removed as line and forms the waveguide in the photonic crystal, and an input end or an output end for inputting and/or outputting the electromagnetic field and, which are mode-coupled to each other and, in which an electromagnetic field inputted to one of the waveguides causes an electromagnetic field to be propagated to the other waveguide, wherein by one of or more than one of (1) effectively changing a medium constant including one of or more than one of a dielectric constant, a refractive index, a conductivity and a magnetic permeability of the photonic crystal, **(2) effectively changing size (to radius r_c) or shape of the photonic crystal elements**, and (3) changing a lattice constant indicating a periodic interval of the photonic crystal elements,

(a) band structures of an even mode and an odd mode of the coupling waveguide are shifted with respect to a normalized frequency, or (b) **the band structures of the even mode and the odd mode of the coupling waveguide are respectively changed at different degrees** (see page 695, left column the last three sentences before the first full paragraph); and by this, a difference in propagation constant between the even mode and the odd mode at a normalized frequency is made large, and a coupling length of a mode-coupled propagating electromagnetic wave which propagates in the coupling

waveguide is made short (see title, abstract and conclusion teaching the coupling region length is reduced).

Re claim 10 feature, *the photonic crystal coupling defect waveguide further comprising a region in which one of or more than one of an effective dielectric constant, a conductivity and a magnetic permeability of the photonic crystal are made variable by a control signal of an electromagnetic field including light or a radio wave and/or an electric field and/or a magnetic field applied from outside, wherein a propagation constant of the electromagnetic wave and/or a degree of coupling can be controlled,* and re claim 28 feature, *the photonic crystal coupling defect waveguide further comprising a region where one of or more than one of an effective dielectric constant, a conductivity and a magnetic permeability of the photonic crystal is made variable by heat applied from outside, wherein a propagation constant of an electromagnetic wave and/or a degree of coupling can be controlled,* a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Allowable Subject Matter

Claim 1 is allowed.

The following is an examiner's statement of reasons for allowance:

The cited prior art fails to teach or fairly suggest the following, especially the emboldened feature:

Re independent claim 1, photonic crystal coupling defect waveguide comprising:
a photonic crystal (PCs) including photonic crystal elements constituting a periodic structure and, for suppressing propagation of an electromagnetic field including light or a radio wave of a specific wavelength or in a specific frequency range; and a coupling waveguide including at least two waveguides, each of which includes a line defect that is a plurality of defects which are portions where the photonic crystal elements constituting the periodic structure of the photonic crystal are locally removed as line and forms the waveguide in the photonic crystal, and an input end or an output end for inputting and/or outputting the electromagnetic field and, which are mode-coupled to each other and, in which an electromagnetic field inputted to one of the waveguides causes an electromagnetic field to be propagated to the other waveguide, wherein by **one of or more than one of** (1) effectively changing a medium constant including one of or more than one of a dielectric constant, a refractive index, a conductivity and a magnetic permeability of the photonic crystal, (2) effectively changing size or shape of the photonic crystal elements, and (3) changing a lattice constant indicating a periodic interval of the photonic crystal elements,
(a) band structures of an even mode and an odd mode of the coupling waveguide are shifted with respect to a normalized frequency, **or** (b) the band structures of the even mode and the odd mode of the coupling waveguide are respectively changed at

different degrees; and by this, a difference in propagation constant between the even mode and the odd mode at a normalized frequency is made large, and a coupling length of a mode-coupled propagating electromagnetic wave which propagates in the coupling waveguide is made short, **further wherein in the part of the photonic crystal including the part of or the whole of the coupling waveguide, the shape of the photonic crystal elements are not changed with respect to the another part, and the lattice constant and the size of the photonic crystal elements are changed similarly and at a same rate as compared with the another part.**

The closest cited prior art Martinez (May 2003 article) shows only the size of the photonic crystal elements (rods) are reduced.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nelson et al (5,999,308) teaches methods and systems for introducing electromagnetic radiation into photonic crystals. Noda et al (6,738,551) teaches two-dimensional photonic crystal and multiplexer/demultiplexer using the same. Yamada (US 2001/0026668) teaches a photonic crystal waveguide and directional coupler using

Application/Control Number:
10/591,471
Art Unit: 2874

Page 7

the same. Notomi et al (6,643,439) teaches photonic crystal waveguide. Shirane et al (2002/0146196) teaches optical switch having photonic crystal structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quyen P. Leung whose telephone number is (571) 272-8188. The examiner can normally be reached on normally M-F, 6:15 am - 2:45 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Quyen Leung/
Quyen Leung
Primary Patent Examiner
Group Art Unit 2874

qpl